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bark or alburnum of either the stem or the root, he proceeded to investigate the states of the leaf, and of the succulent annual shoot. With this view various grafts of the golden pippin, which were known to be liable to decay, were inoculated with buds of new varieties; and in the ensuing winter their own *natural* buds were removed, and those that had been inserted were alone allowed to remain. As soon as the leaves of these began to appear, every symptom of disease was removed; and each part of the branch of the golden pippin thus regenerated, appeared to perform its office as well as the wood and bark of the seedling stock could have done without this intermediate graft of old materials.

Since the vigour of youth, or debility and diseases of old age, appeared thus to depend on the quality of the leaf through which the sap of plants circulates, in the same manner as the blood of animals does through their lungs, Mr. Knight considers the consequence of defective leaves, according to his former views of the functions they perform, of preparing and assimilating the sap transmitted through them; and he observes, that the deficiency of power in the leaves is (as might be expected) most apparent where the redundancy of sap is the greatest; for he finds that the grafts of old varieties are most diseased in rich soils, or when they are applied to vigorous stocks; and the defects appear to arise from an accumulation of fluid in the extreme branches and annual shoots, beyond what can circulate with effect through the imperfect leaves that are produced by extremities debilitated by age.

In support of this opinion, of an essential difference between the leaves of young and of old varieties, Mr. Knight observes, that there is an evident alteration in the character of leaves visible in the same variety, between those of two years and those of twenty years old; and that it is consequently highly probable that still further changes have occurred in the course of two centuries.

From these results respecting the importance of the leaves to the well-being of vegetables, the author ventures to suggest the probability, that the debilities of old age in animals may arise from a similar source, and may be traced to injury primarily sustained by the lungs.

It is not merely upon general analogy that such an opinion may be supported, but in particular instances of long life in men and in domesticated animals, it is observed that those individuals longest retain their health, and are most able to bear excessive labour without injury to their constitution, in whom the chest is manifestly most capacious.

On the Gizzards of Grazing Birds. By Everard Home, Esq. F.R.S.
Read April 4, 1810. [*Phil. Trans.* 1810, p. 184.]

Since the organs of digestion in those quadrupeds which live wholly upon grass differ considerably in their construction from those

of other quadrupeds, and in greater or less degree according to the different qualities of their food, it was natural to expect some correspondent peculiarities in the gizzards of those birds which feed on grass, to fit them for digesting this kind of food.

With this view the author has examined the gizzards of the goose and swan, in comparison with that of the turkey, which feeds on a different kind of food.

For the purpose of rendering the fibres distinct, so as easily to be traced, the gizzards of each were boiled, after having been previously filled with plaster of Paris. In the turkey the two muscles, of which the gizzard consists, are of unequal strength, that on the left side being considerably stronger than that on the right. These muscles, by their alternate action, produce a constant friction on the contents; for though the direct pressure inwards is very great, the lateral motion occasions the force employed upon the substances contained, to be applied in an oblique direction, as Spallanzani and others have observed.

The internal cavity being of an oval form, like a pullet's egg, rounded on all sides, does not allow the opposite sides ever to come into contact; so that the food is triturated merely by the intermixture of bodies harder than itself.

In the goose and swan, on the contrary, the cavity is flattened, with its edges very thin. The surfaces applied to each other are, however, not plane surfaces; but a concave surface is applied to one that is convex; and in the left side the concavity is above; but the curvature changes, so that on the right side the concavity is below. In these gizzards the horny covering of their surface is much stronger than in the turkey, and rough; so that by a sliding motion of the parts opposed, the food is ground, although they do not admit the intervention of hard substances of a large size, and almost without requiring such assistance.

In the lower part of the œsophagus of these birds, the author observes an enlargement, which he considers peculiar to them, and thinks it answers the purpose of a reservoir, in which the grass is retained, macerated, and prepared, as in ruminating animals, for the subsequent process of rumination.

Observations on Atmospherical Refraction as it affects astronomical Observations; in a Letter from S. Groombridge, Esq. to the Rev. Nevil Maskelyne, D.D. F.R.S. Astronomer Royal. Communicated by the Astronomer Royal. Read March 28, 1810. [Phil. Trans. 1810, p. 190.]

Mr. Groombridge being in possession of a transit circle four feet in diameter, made by Troughton, undertook a series of observations upon circumpolar stars, for the purpose of determining the latitude of his observatory.